

Nucleonica: Core Applications and Case Studies

BfS training course with “Hands on” exercises, 27-28 November 2013, Köpenicker Allee 120-130, 10318 Berlin

Training Course / Nucleonica Overview

Dr. Joseph Magill,
Nucleonica GmbH,
Karlsruhe

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nucleonica ... web driven nuclear science

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NUCLEAR NEWS

New telescope to guard Earth from killer asteroids

JUN 30 Some 500,000 asteroids are circulating near-Earth space and some of them may pose a real danger to our planet. But a US company says it plans to build a telescope that will be able to watch them. Read [...]

U.N. publishes report on Iran arms trade with Syria

JUN 30 UNITED NATIONS (Reuters) - A U.N. Security Council committee has published a report on Iranian sanctions violations, including shipments of weapons to Syria in breach of a U.N. ban on weapons exports [...]

More firms in danger of systems meltdown, claims risk expert

What is Nucleonica?

- » Nucleonica is an innovative professional and technical resource for knowledge creation and competence building for the worldwide nuclear science community. The portal has grown to become the leading online resource nuclear sciences and is particularly suitable for education and training of scientists, engineers and technicians in the nuclear domain. Our application enable researchers and specialists to make complex and precise calculations in state-of-the-art fashion.
- » Nucleonica is aimed at scientists, engineers and technical personnel working in the fields of nuclear power, health physics, radiation protection, nuclear and radiochemistry, decommissioning, nuclear medicine, etc. It can be used by professionals for everyday calculations, obtaining quick results and testing, validating and verifying complex computer models.
- » Nucleonica provides you with user-friendly access to the latest reference data from internationally evaluated nuclear data. A unique feature is the wide range of web-based nuclear science applications. A variety of social networking tools are provided for scientific collaboration. In addition, Nucleonica offers a range

NUCLEONICA HOT TOPICS

» New Virtual Cloud Chamber

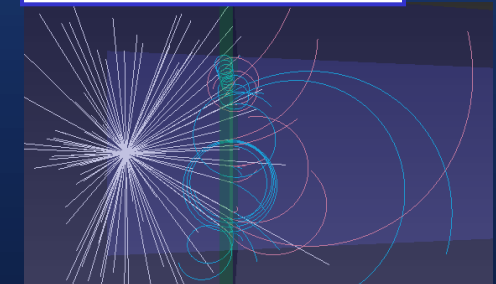
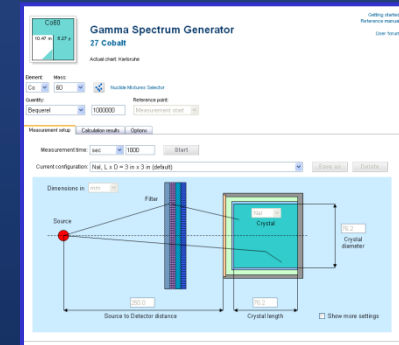
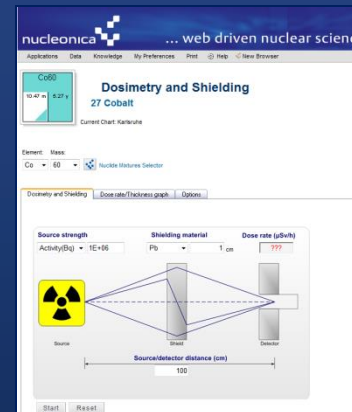
November 10, 2011

We announce the release of a new Nucleonica module: the Virtual Cloud Chamber. This powerful application is an online interactive simulation tool for investigating the

Nucleonica: Web-based Software Tools for Simulation and Analysis



- Nuclear Data Resources in Nucleonica
- Nuclear Science Applications & Tools
 - Decay Engine
 - Dosimetry & Shielding
 - Virtual Cloud Chamber
 - Gamma Spectrum Generator
 - webKORIGEN
 - e-Ship
- Education & Training with Nucleonica
 - Nucleonica Mobile
 - Karlsruhe Nuclide Chart
- Knowledge Management with Nucleonica



These lectures are available online:

http://www.nucleonica.com/wiki/index.php?title=Training_Course_Proceedings#Nov. 2013_BfS.2C_Berlin

Links to the presentations:

- go to wiki on main Nucleonica page

- click on Training Courses

- at bottom of page click on Training Course Proceedings

Previous Training Courses

[edit]

Nov. 2013 BfS, Berlin

[edit]

Nucleonica: Core Applications and Case Studies, 27-28 November, BfS Berlin, 2013.

This 1-day training course took place at the offices of the Federal Office for Radiation Protection (Bundesamt für Strahlenschutz BfS) in Berlin, during the 27-28 November 2013. This was an intermediate level training course which focused mainly on the Nucleonica core applications with emphasis on Case Studies. A detailed description of nuclear data with particular reference to the various Nucleonica nuclear databases was given. Core applications were demonstrated through the use of Nucleonica applications such as the Mass Activity Converter, Nuclide Mixtures, Decay Engine++, and Dosimetry and Shielding++. Two new nuclear security related case studies were given on the identification of suspected nuclear and radioactive materials.

In total, 12 persons took part in the course from the various BfS locations in Germany. Speakers included Drs. Z. Soti from the JRC/ITU in addition to Dr. J. Magill and Mr. R. Dreher from the Nucleonica team.

[Agenda November 2013](#)

[Meet the Trainers for this course](#)

[Links to the presentations \(to be updated before the course\):](#)

[Nucleonica Overview \(J. Magill\)](#)

[Mass Activity Converter \(R. Dreher\)](#)

[Nuclide Mixtures \(R. Dreher\)](#)

[Decay Engine++ \(J. Magill\)](#)

[Gamma Dosimetry & Shielding++ \(J. Magill\)](#)

[Nuclear Data: from the Karlsruhe Nuclide Chart to Nucleonica \(Z. Soti\)](#)

[Case Study I](#)

[Case Study II](#)

[Nucleonica Tips & Tricks \(J. Magill\)](#)

[Nucleonica brochure](#)



Stopping of 500 keV beta particles in 1 mm tissue.



Course Folders...



	
Nucleonica: Core Applications and Case Studies	
BFS training course with "Hands on" exercises, 27-28 November 2013, Köpenicker Allee 120-130, 10318 Berlin	
27. Nov. – Core Applications and Tools	
13:30	Training Course / Nucleonica Overview J. Magill (Nucleonica)
14:15	Mass Activity Converter R. Dreher
15:10 – Coffee	
15:30	Nuclide Mixtures R. Dreher
16:30	Decay Engine J. Magill
17:30	– End of session
28. Nov. – Core Applications and Case Studies	
9:00	Gamma Dosimetry & Shielding J. Magill
	Nuclear Data: from the Karlsruhe Nuclide Chart to Nucleonica, Z. Soti (ITU)
10:30 – Coffee	
10:50	Case Study I J. Magill
11:40	Case Study II Z. Soti
12:30	Nucleonica Tips & Tricks J. Magill
12:50	Feedback/Questionnaire, Certificate
13:00	– End of Training Course

Nucleonica: Core Applications and Case Studies

BfS training course with "Hands on" exercises, 27-28 November 2013, Köpenicker Allee 120-130, 10318 Berlin

27. Nov. – Core Applications and Tools

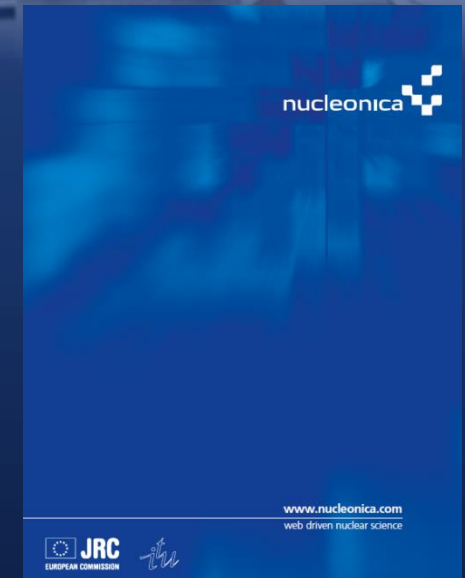
			Index
13:30	Training Course / Nucleonica Overview J. Magill (Nucleonica)		1
14:15	Mass Activity Converter R. Dreher	Exercises	2
15:10 – Coffee			
15:30	Nuclide Mixtures R. Dreher	Exercises	3
16:30	Decay Engine J. Magill	Exercises	4
17:30 – End of session			

28. Nov. – Core Applications and Case Studies

9:00	Gamma Dosimetry & Shielding J. Magill	Exercises	5
	Nuclear Data: from the Karlsruhe Nuclide Chart to Nucleonica, Z. Soti (ITU)	Exercises	6
10:30 – Coffee			
10:50	Case Study I J. Magill		7
11:40	Case Study II Z. Soti		8
12:30	Nucleonica Tips & Tricks J. Magill		9
12:50	Feedback/Questionnaire, Certificate		
13:00 – End of Training Course			

How can Nucleonica help you?

- Nucleonica provides you with user friendly access to the latest reference data from internationally evaluated nuclear data.
- A unique feature is the wide range of validated web-based nuclear science applications for decay calculations, dosimetry & shielding, gamma spectrometry, etc.
- In addition Nucleonica offers a range of introductory and advanced training courses in various areas of nuclear science.

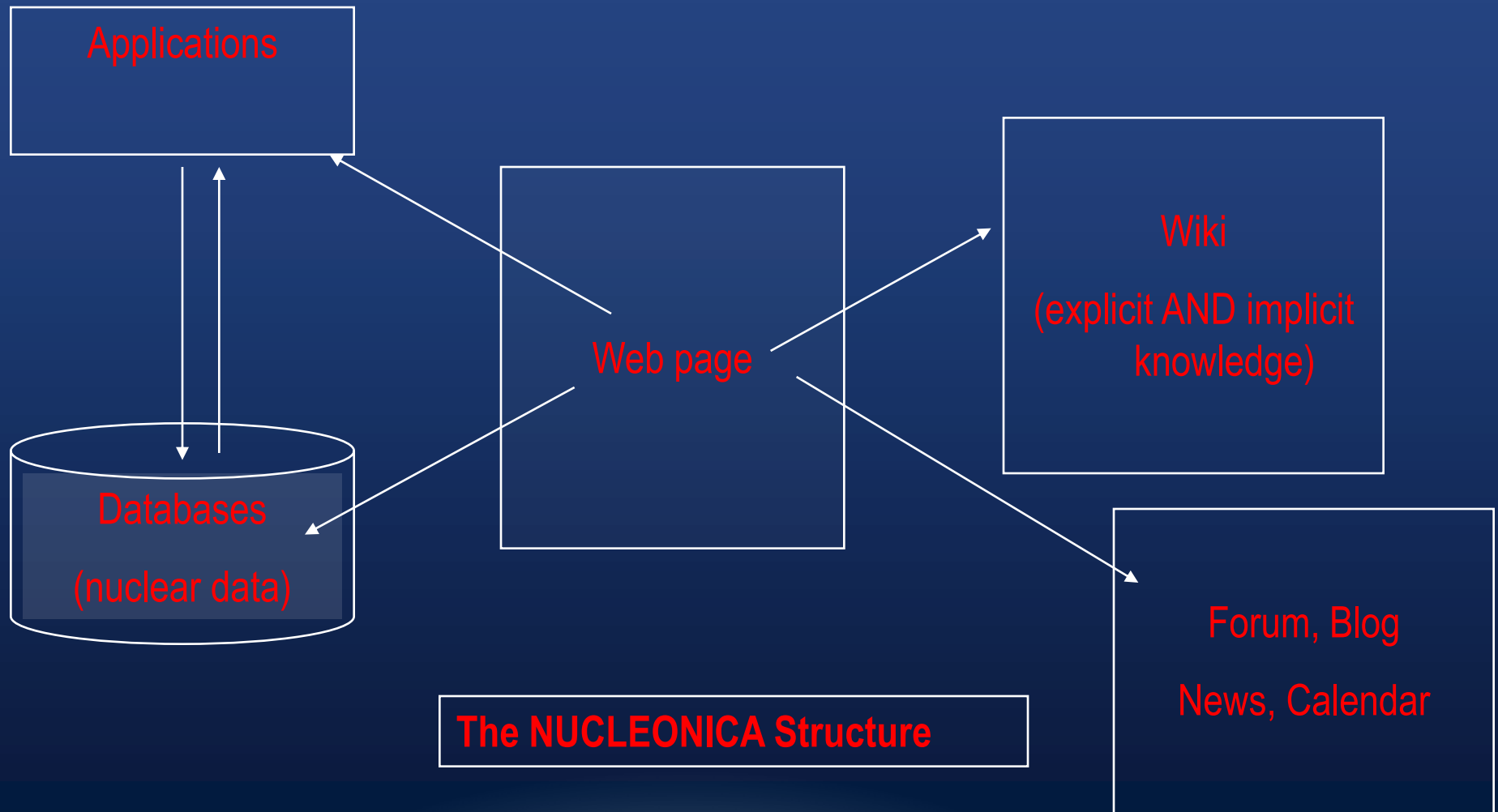


Nucleonica is already being used by thousands of scientists and students worldwide in over 92 countries. Due to its advanced IT features, user friendly and intuitive environment, the platform has recently been endorsed by the Sustainable Nuclear Energy Technology Platform (www.snetp.eu):



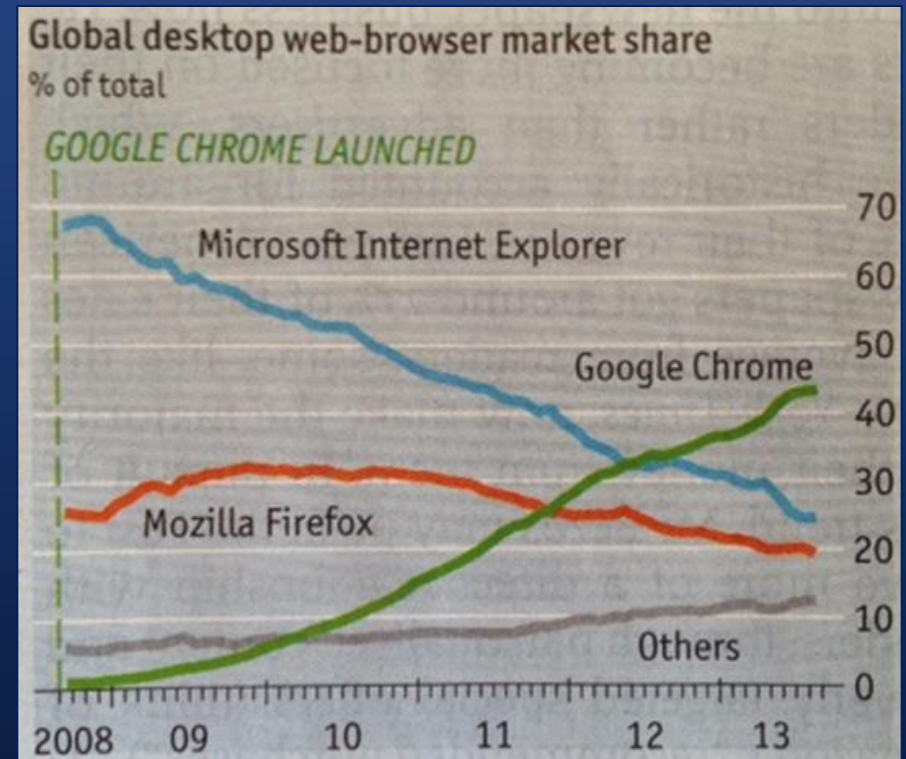
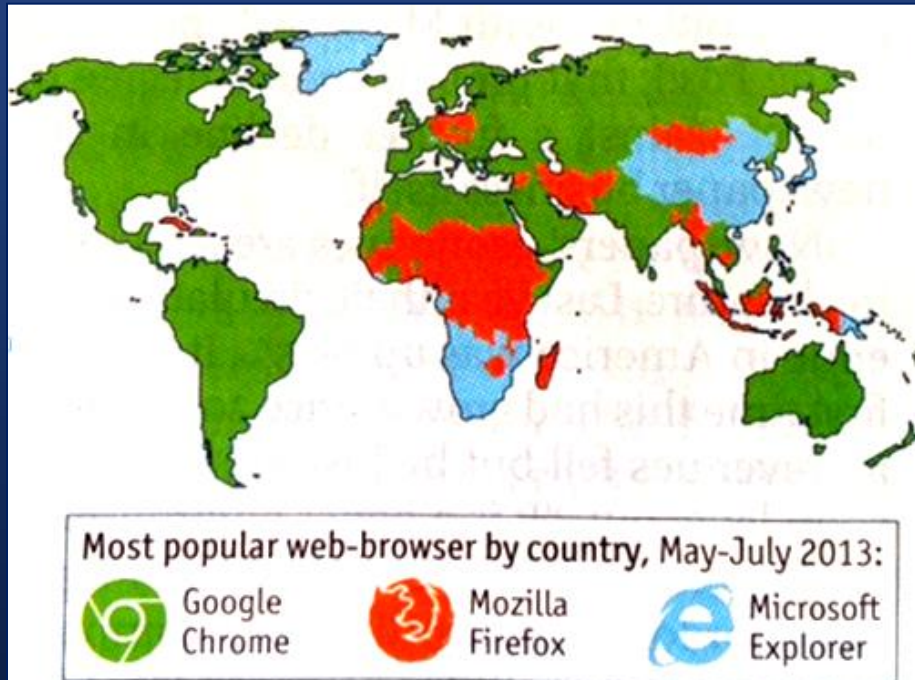
“Nucleonica plays ... an important role in making nuclear education more attractive and in building nuclear knowledge for a new generation of engineers and scientists”

Nucleonica Architecture & Logical Structure...



Which browser?

Nucleonica supports mainly Chrome, Firefox, and IE9, and Safari



Nuclear Data Resources in Nucleonica: Nuclide Datasheets++

Version: 2013.07.26 10:38:01

Questions, remarks, suggestions can be posted in the forum

CPU-Time / Total-Time: 2.9 / 5.1 sec

Reference Data Options Radiations Description Derived Data Cross Sections Prompt Gammas

> Nucleonica Databases

Compare Databases:

	JEFF-3.1	ENDF/B-VII.1	Nubase 2003	Nubase 2012	ICRP-72
60 27 Co ₃₃					
Density					
Mass Excess			-81649.012 (± 828) keV	-81649.720 (± 523) keV	
Atomic Mass			59.933817059 (± 874) u	59.933816299 (± 561) u	
Half-life	5.271 (± 1) y	5.2712000 (± 3833) y	5.2713 y 0.0008		
Spin	5 h	5 h	5+		
Parity	+	+			
Binding Energy			8.74675 MeV/nucleon		
Abundance			-		
Effective Dose Coefficient Inhalation					
Effective Dose Coefficient Ingestion					
Mean Decay Energies					
Alpha	0 (MeV)	0 MeV			
Electron	96.7734 (keV)	96.7691 keV			
Photon	2503.84 (keV)	2503.84 keV			
Decay					
Co 60 (β-) 28 Ni 60	Branching ratio 1	1			
	Decay Energy, Q 2.8239 (MeV)	2.8239 (MeV)			
Decay Production					
27 Co 60m (IT) Co60	Branching ratio 0.9975	0.9976			
	Decay Energy, Q 0.0586 (MeV)	0.058603 (MeV)			

Download ☒ Excel ☐ CSV Separator: ☒ Use field qualifier (?)

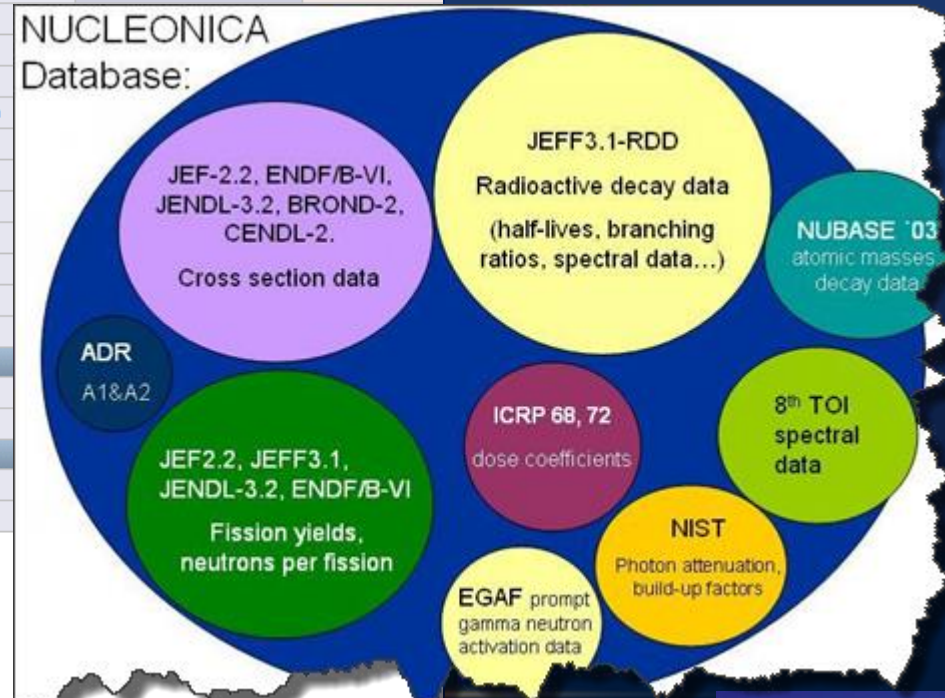
60
27 **Co**₃₃ ☒ gamma ☐ beta⁻ ☐ discrete e⁻ ☐ X-rays & annihilation

Type	Energy(keV) JEFF-3.1	Energy(keV) ENDF/B-VII.1	Emission Probability JEFF-3.1	Emission Probability ENDF/B-VII.1
γ	1332.490 (± 0.004)	1332.492 (± 0.004)	9.998260e-1 (± 6.0e-6)	9.998260e-1 (± 6.0e-6)
γ	1173.230 (± 0.003)	1173.228 (± 0.003)	9.9850e-1 (± 3.0e-4)	9.9850e-1 (± 3.0e-4)
γ	826.100 (± 0.030)	826.100 (± 0.030)	7.60e-5 (± 8.0e-6)	7.60e-5 (± 8.0e-6)

Main Nucleonica database JEFF3.1 contains decay data on 3852 nuclide.

New:
ENSDF/B-VII.1

NUCLEONICA Database:



Nuclear Data Resources in Nucleonica:

Nuclide Datasheets++:

User friendly access to internationally evaluated nuclear data

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Applications Data Knowledge My Preferences Print Networking Nuclear Science Help New Browser Tab Logout

Version: 2013.08.26 13:09:45

Questions, remarks, suggestions can be posted in the forum

Nuclide Datasheets++
95 Americium
Current Chart: Karlsruhe

Element: Am Mass: 241

Reference Data Options Radiations Description Derived Data Cross Sections Prompt Gammas

» Nucleonica Databases

Compare Databases:

	JEFF-3.1	ENDF/B-VII.1	Nubase 2003	Nubase 2012
241 95Am ₁₄₆				
Density				
Mass Excess				
Atomic Mass				
Half-life	432.8 (± 7) y			
Spin	5/2 h			
Parity	-			
Binding Energy				
Abundance				
Effective Dose Coefficient Inhalation				
Effective Dose Coefficient Ingestion				
Mean Decay Energies				
Alpha	5.55744 (MeV)			

Am241 Radiations (JEFF-3.1)

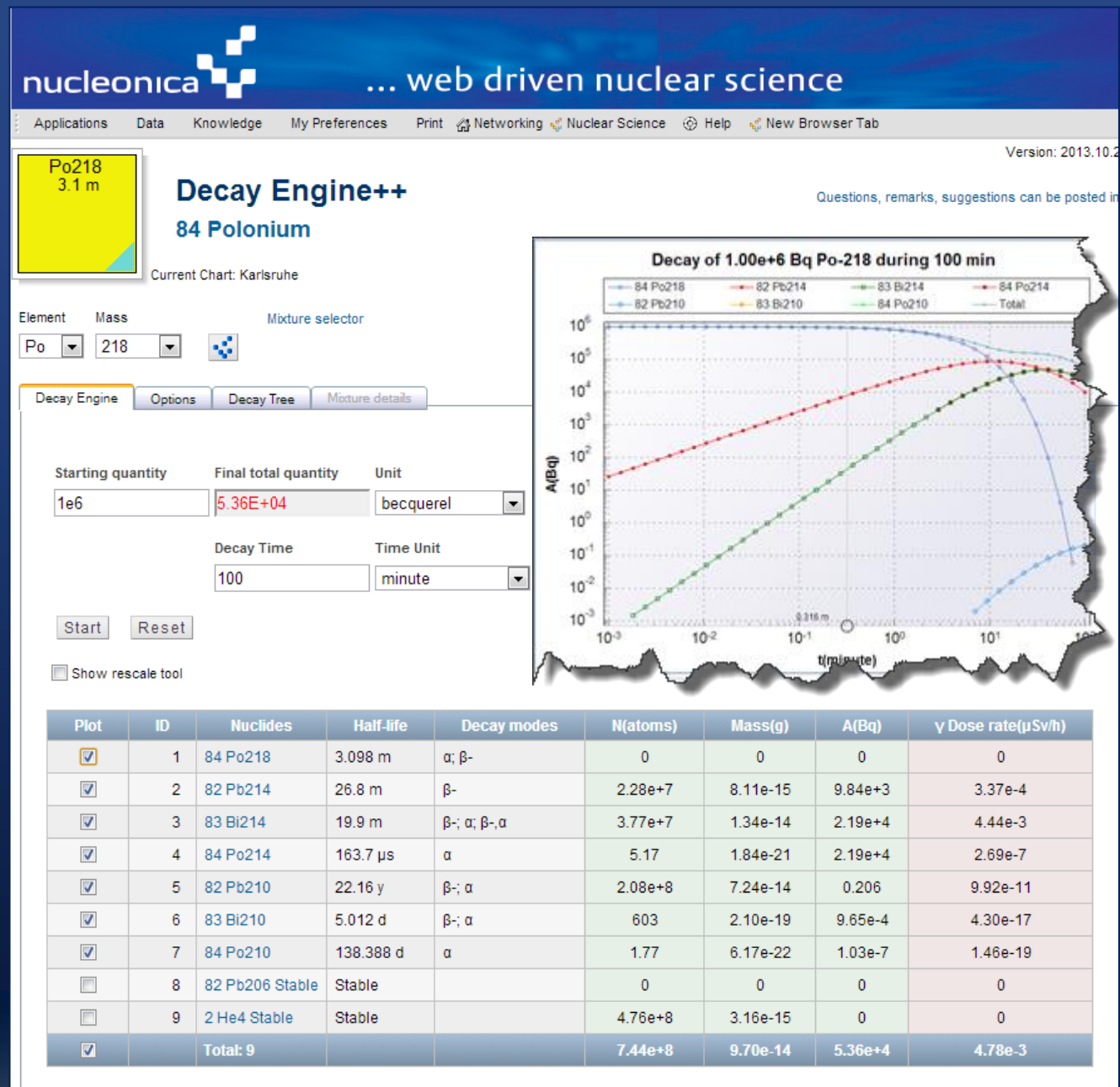
Emission Probability

Legend: gamma, alpha, discrete e⁻, X-rays

Type	E (keV)	Prob.
α ¹	4.800	1.00e+0
α ²	5405.800	8.40e-2
α ³	55.994	6.51e-3
α ⁴	55.5412	3.0e-3
α ⁵	14.440	3.31e-3
α ⁶	41.9312	3.02e-4
α ⁷	15.5864	1.70e-4
α ⁸	5442.900	1.31e-4
α ⁹	8.7348	1.20e-4
α ¹⁰	94.9322	1.15e-4
α ¹¹	25.910	8.11e-5
α ¹²	4.800	8.90e-2
α ¹³	25.5204	8.94e-2
α ¹⁴	21.7368	4.97e-3
α ¹⁵	38.912	2.90e-3
α ¹⁶	26.3448	2.40e-3
α ¹⁷	25.110	2.31e-3
α ¹⁸	8.420	1.87e-3
α ¹⁹	5366.400	1.85e-3
α ²⁰	37.940	9.10e-4
α ²¹	38.112	7.70e-4
α ²²	22.432	6.50e-4
α ²³	27.940	6.0e-4
α ²⁴	5544.240	3.0e-4
α ²⁵	16.942	3.0e-4

Validated Nuclear Science Applications & Tools

Radioactive decay calcluations with Decay Engine++



Validated Nuclear Science Applications & Tools

Dosimetry & Shielding++

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Applications Data Knowledge My Preferences Print Networking Nuclear Science

Co60
10.47 m 5.27 y

Dosimetry and Shielding++

27 Cobalt

Current Chart: Karlsruhe

Element: Co Mass: 60

☐ Include daughters

Dosimetry and Shielding Dose rate/Thickness

Initial source strength
Activity(Bq): 1.00e+6

Shielding material
Pb 1 cm

Dose rate (μSv/h)
2.67E-01

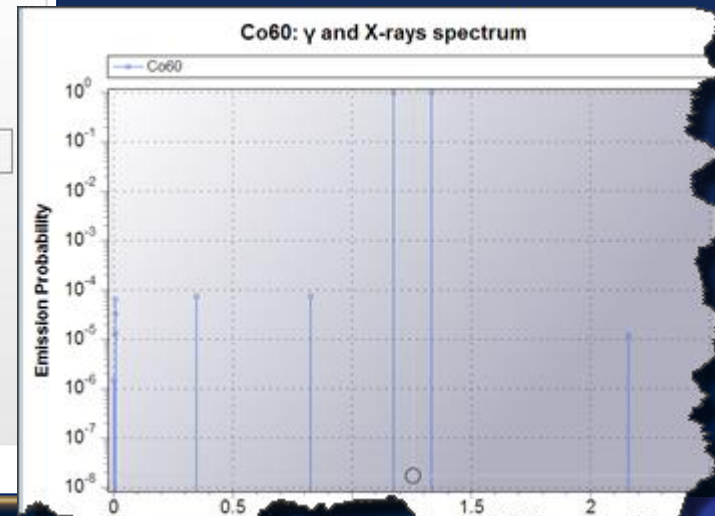
Source Shield Detector

Source/detector distance (cm): 100

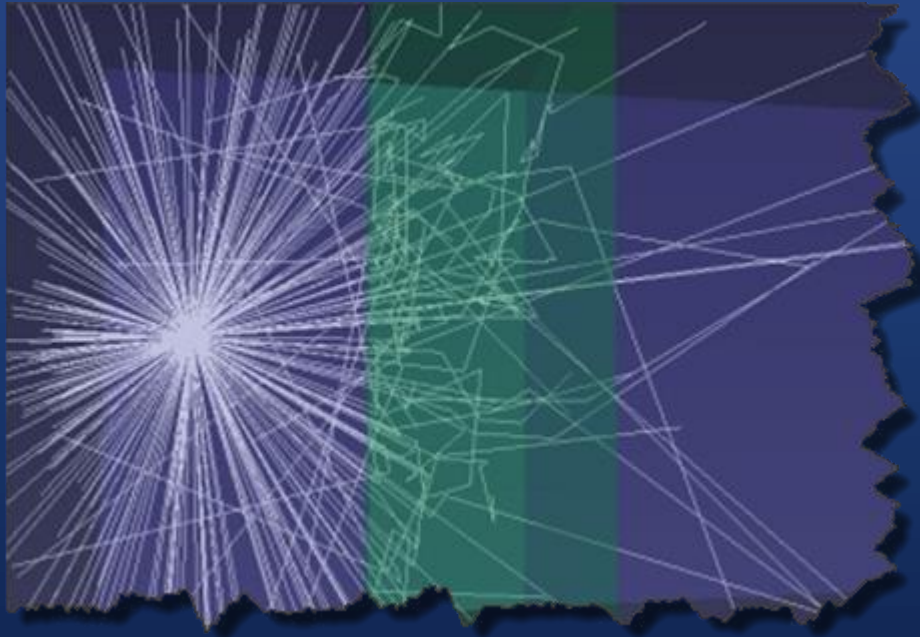
Start Reset

☒ Show radiation details

Neclide	Gamma Energy (keV)	Emission Probability (per disintegration)	Mass Attenuation Coefficient (shielding)(cm ² /g)	Number of Mean Free Paths (μ-d)	Build-up Factor	Mass Absorption Coefficient (tissue)(cm ² /g)	Tissue γ Dose Rate(μSv/h)	γ Exposure Rate(μGy/h)
27 Co 60	1332.49	1.00E+00	5.64E-02	6.40E-01	1.53E+00	2.89E-02	1.43E-01	1.31E-01
27 Co 60	1173.23	9.99E-01	6.20E-02	7.04E-01	1.57E+00	2.98E-02	1.25E-01	1.17E-01
27 Co 60	826.1	7.60E-05	8.59E-02	9.75E-01	1.69E+00	3.16E-02	5.83E-06	5.31E-06
27 Co 60	2158.57	1.20E-05	4.54E-02	5.15E-01	1.49E+00	2.52E-02	2.68E-06	2.48E-06
27 Co 60	347.14	7.50E-05	3.05E-01	3.46E+00	1.80E+00	3.21E-02	2.18E-07	1.95E-07
27 Co 60	2505.69	2.00E-08	4.39E-02	4.99E-01	1.48E+00	2.40E-02	4.97E-09	4.83E-09
27 Co 60	0.85	1.49E-06	7.16E+03	8.12E+04	1.00E+00	5.38E+03	0.00E+00	0.00E+00
27 Co 60	8.26	1.31E-05	2.11E+02	2.40E+03	1.00E+00	9.01E+00	0.00E+00	0.00E+00
27 Co 60	7.46089	3.27E-05	2.72E+02	3.09E+03	1.00E+00	1.23E+01	0.00E+00	0.00E+00
27 Co 60	7.5815	6.44E-05	1.71E+02	3.07E+03	1.00E+00	1.22E+01	0.00E+00	0.00E+00

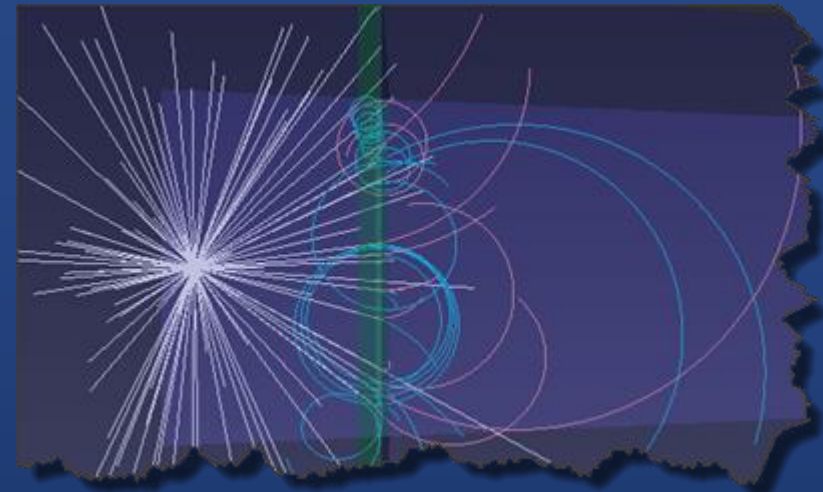


Virtual Cloud Chamber

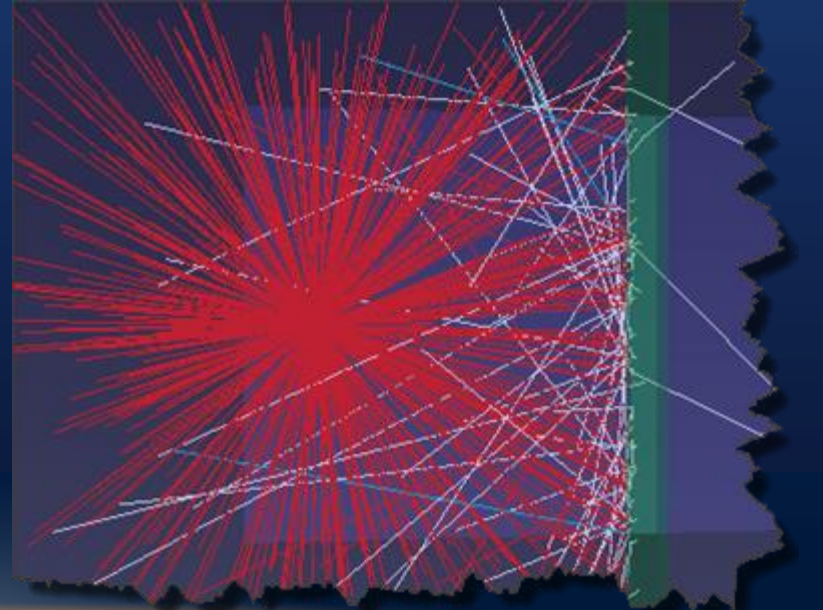


low energy photons (energy 100 keV) are attenuated with a thick (15 cm) water shield. This combination of low energies and thick shields give rise to multiple scattering of the radiation

The red particles (3 MeV positrons) are blocked by a lead shield (green). When the positrons collide with the shield, they combine with electrons (blue) to create gamma radiation (white). Only a few gamma photons pass through the shield material.

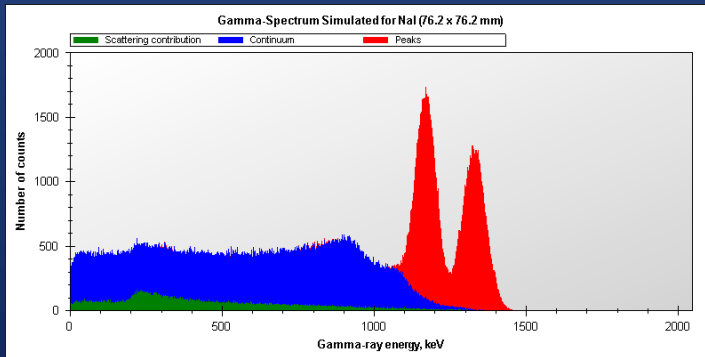


Electron-positron pairs are created using 10 MeV photons on lead. By “switching off” energy loss mechanisms, the charged particles are seen to spiral in the applied magnetic field.

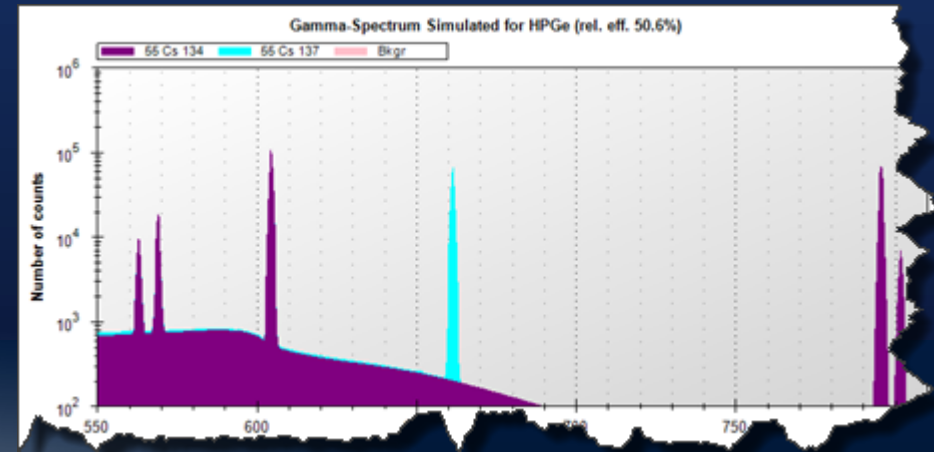
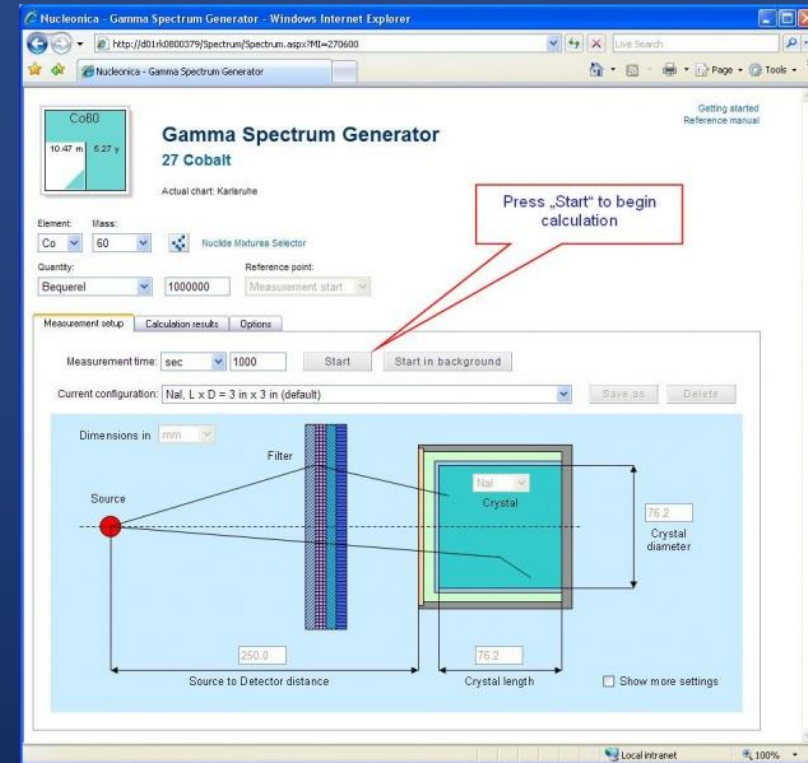
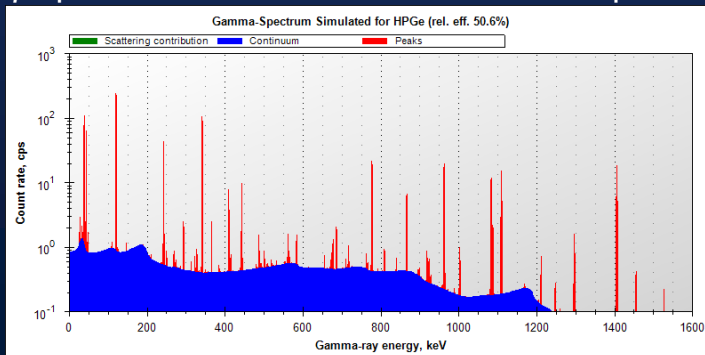


Gamma Spectrum Generator

γ -spectrum simulated for ^{60}Co 100 kBq source and NaI (3" \times 3") detector:




γ -spectrum simulated for ^{152}Eu 100 kBq source and HPGe detector.



Fukushima: Gamma spectrum of contamination at the Daiichi plant.
Contamination is almost entirely to cesium-137 and cesium -134

Validated Nuclear Science Applications & Tools


webKORIGEN fuel depletion calculations & neutron activation



... web driven nuclear science

Applications Data Knowledge My Preferences Print Networking Nuclear Science Help New Browser


Version: 2012.08.09 17:55:51



webKORIGEN

Questions, remarks, suggestions can be posted in the [forum](#)

webKORIGEN was developed from the Oak Ridge Isotope Generation and Depletion code ORIGEN. Starting with a given initial reactor fuel or a single target nuclide, it calculates the time evolution of nuclide densities changing due to decays and neutron-induced reactions, and determines derived nuclear properties such as masses, radioactivities, heat releases, radiotoxicities, emission of radiation, etc...



webKORIGEN

Questions, remarks, suggestions can be posted in the [forum](#)

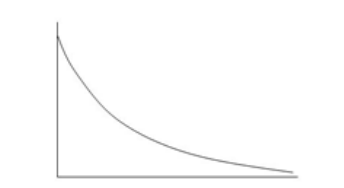
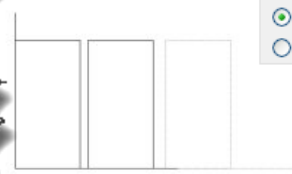
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Step 1: Calculation Mode Step 2: Reactor / Operation Step 3: Input Summary and Run Step 4: Display Results Step 5: Log files Step 6: Parameters

Step 1: Calculation Mode

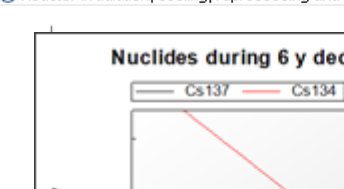
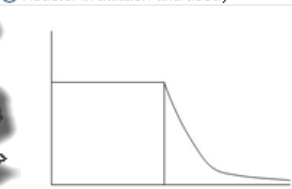
☒ Reactor irradiation ☐ Decay

☒ Power ☐ Flux



Step 2: Reactor / Operation

☐ Reactor irradiation and decay ☐ Reactor irradiation, cooling, reprocessing and decay of waste



Step 3: Input Summary and Run

Display results for nuclides/elements dominant at 6 y decay

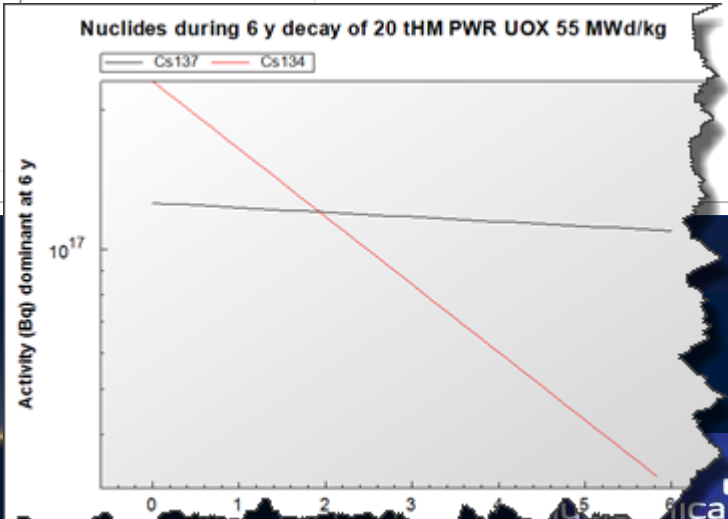
Nuclides/Element Radiations Nuclide Chart

Display quantity: Mass (g) Filter: Save as Mixture ... of up to 20 selected Nuclides

Plot	Z	Nuclide	Results	Plot	Z	Element	Results	Plot	Totals	Nuclides	Elements	Results
<input type="checkbox"/>	55	Cs133	3.415e+4	<input type="checkbox"/>	92	Uranium	1.861e+7	<input checked="" type="checkbox"/>	Actinides+Progenies:	92	19	1.887e+7
<input checked="" type="checkbox"/>	55	Cs137	3.410e+4	<input type="checkbox"/>	94	Plutonium	2.276e+5	<input type="checkbox"/>	Actinides	61	11	1.887e+7
<input type="checkbox"/>	55	Cs135	1.298e+4	<input type="checkbox"/>	54	Xenon	1.699e+5	<input type="checkbox"/>	Transactinides	38	7	2.610e+5
<input checked="" type="checkbox"/>	55	Cs134	6.415e+2	<input type="checkbox"/>	60	Neodymium	1.252e+5	<input type="checkbox"/>	Misc Actinides	21	3	3.341e+4
<input type="checkbox"/>	55	Cs136	5.206e-9	<input type="checkbox"/>	40	Zirconium	1.150e+5	<input type="checkbox"/>	Radon	3	1	1.417e-9
<input type="checkbox"/>	55	Cs138	4.691e-10	<input type="checkbox"/>	42	Molybdenum	1.084e+5	<input checked="" type="checkbox"/>	Fission Products:	725	44	1.096e+6
<input type="checkbox"/>	55	Cs139	1.107e-10	<input checked="" type="checkbox"/>	55	Cesium	8.098e+4	<input type="checkbox"/>	Lanthanides	138	12	3.174e+5
<input type="checkbox"/>	55	Cs140	9.061e-12	<input type="checkbox"/>	56	Cerium	7.809e+4	<input type="checkbox"/>	Rare Earths	180	14	3.445e+5
<input type="checkbox"/>	55	Cs138m	8.910e-12	<input type="checkbox"/>	44	Ruthenium	7.039e+4	<input type="checkbox"/>	Noble Metals	90	4	1.385e+5
<input type="checkbox"/>	55	Cs141	2.523e-12	<input type="checkbox"/>	56	Barium	5.764e+4	<input type="checkbox"/>	Metals (Ne, Ar, Kr, Xe)	46	2	1.800e+5
<input type="checkbox"/>	55	Cs135m	1.396e-12	<input type="checkbox"/>	46	Palladium	5.336e+4	<input type="checkbox"/>	Hydrogen	3	1	1.275e+0
<input type="checkbox"/>	55	Cs134m	1.226e-13	<input type="checkbox"/>	57	Lanthanum	3.918e+4	<input type="checkbox"/>	Helium	1	1	9.335e+1
<input type="checkbox"/>	55	Cs142	5.936e-14	<input type="checkbox"/>	59	Praseodymium	3.625e+4	<input type="checkbox"/>	Total	823	64	1.997e+7
<input type="checkbox"/>	55	Cs143	1.592e-14	<input type="checkbox"/>	62	Samarium	2.612e+4					
<input type="checkbox"/>	55	Cs144	1.650e-15	<input type="checkbox"/>	43	Technetium	2.462e+4					
<input type="checkbox"/>	55	Cs145	6.462e-17	<input type="checkbox"/>	38	Strontium	2.433e+4					
<input type="checkbox"/>	55	Cs146	2.443e-18	<input type="checkbox"/>	93	Neptunium	1.574e+4					
<input type="checkbox"/>	55	Cs147	1.534e+4	<input type="checkbox"/>	54	Xenon	1.534e+4					

Nuclides during 6 y decay of 20 tHM PWR UOX 55 MWd/kg

— Cs137 — Cs134



Validated Nuclear Science Applications & Tools

e-Ship++:

package classification for radioactive transports

e-Ship: nuclear material transport report

Transport report generated for source: Irradiated sample (Iron) by las1 las1 on Aug 21, 2013 11:24:31
DISCLAIMER: this tool is a help to choose the package classification, please always refer to the country specific regulations

Package name: Irradiated sample (Iron)
Description: Package created from CERN spectrum file. The activity was reported on 27.2.2012.
Package characterisation: Material, Other form, Solid
Host material mass: 1 g
Activity reported: Feb 27, 2012 08:00:00

Please take care of subsidiary risk.

Chemical form:

For the definition of the quantities used in this report see the Nucleonica Glossary

Source characterisation

Data extracted from Swiss RPO, Appendix 3, pages 65... from 1 January 2013.

Nuclide	Half-life	Activity (Bq)	Heat (W)	Ambient dose rate H_{10} (μ Sv/h) at 10 cm	E_{α} (MeV)	E_{β} (MeV)	A(Bq)/L(LBq)	A(Bq/g)	A(Bq/L)	Radioactive contents	Notes
Be-7	53.22 d	3.11e+4	2.45e-10	2.45e-2	8.71e-4	1.71e-3	7.75e-2	7.75e-1	3.11e-4	(Sv)	
Co-56	77.31 d	1.85e+2	1.11e-10	9.02e-3	4.65e-4	1.25e-3	4.65e-2	4.65e+1	1.85e-4	(Sv)	
Co-57	271.80 d	1.02e+3	2.34e-11	2.14e-3	2.14e-4	1.02e-3	2.04e-2	2.04e+1	1.23e-4	(Sv)	
Co-58	70.86 d	7.22e+2	1.17e-10	1.05e-2	5.34e-4	1.52e-3	7.22e-2	7.22e+1	2.41e-4	(Sv)	
Co-60	5.271 y	1.15e+2	4.95e-11	4.35e-3	4.05e-4	3.05e-3	1.15e-1	1.15e+2	1.32e-3	(Sv)	
Mn-54	312.13 d	7.85e+2	1.05e-10	9.90e-3	5.59e-4	1.18e-3	7.85e-2	7.85e+1	1.97e-4	(Sv)	
Na-22	2.6027 y	5.25e+4	2.00e-8	1.73e-0	1.85e-1	6.83e-2	1.75e+1	1.75e+4	1.75e-2	(Sv)	
Sc-46	83.79 d	2.24e+2	7.80e-11	6.70e-3	3.35e-4	1.52e-3	3.20e-2	3.20e+1	2.24e-4	(Sv)	
Ta-182	114.7 d	3.23e+2	7.75e-11	5.27e-3	4.85e-4	3.23e-3	4.61e-2	4.61e+1	4.61e-4	(Sv)	
Y-88	106.63 d	1.45e+2	6.27e-11	5.51e-3	1.89e-4	6.35e-4	1.81e-2	1.81e+1	7.25e-5	(Sv)	
Total: 55		8.71e+4	2.09e-8	1.81e+0	1.72e-1	8.40e-2	1.80e+1	1.80e+4	2.06e-2		

Package characterisation

Data extracted from ADR Table of A_1 , A_2 values, exemption limits and notes (pages 218...)

Nuclide	Activity (Bq)	A_1 (TBq)	Exempt (Bq)	Exempt (Bq/g)	Exempt (GBq)	A_2 (TBq)	Exempt (Bq/g)	A_1 (TBq/g)	Exempt (Bq/g)	A_2 (TBq/g)	Exempt (Bq/g)
Be-7	3.11e+4	2.00e+1	1.00e+7	1.00e+3	2.00e+1	1.55e-9	3.11e-3	3.11e+1	1.55e-6		
Co-56	1.85e+2	3.00e+1	1.00e+5	1.00e+1	3.00e+1	6.20e-10	1.85e-3	1.85e+1	6.20e-7		
Co-57	1.02e+3	1.00e+1	1.00e+6	1.00e+2	1.00e+1	1.02e-10	1.02e-3	1.02e+1	1.02e-7		
Co-58	7.22e+2	1.00e+1	1.00e+6	1.00e+1	1.00e+1	7.22e-10	7.22e-4	7.22e+1	7.22e-7		
Co-60	1.15e+2	4.00e+1	1.00e+5	1.00e+1	4.00e+1	2.98e-10	1.15e-3	1.15e+1	2.98e-7		
Mn-54	7.85e+2	1.00e+1	1.00e+6	1.00e+1	1.00e+1	7.85e-10	7.85e-4	7.85e+1	7.85e-7		
Na-22	5.25e+4	5.00e+1	1.00e+6	1.00e+1	5.00e+1	1.05e-7	5.25e-2	5.25e+3	1.05e-4		
Sc-46	2.24e+2	5.00e+1	1.00e+6	1.00e+1	5.00e+1	4.45e-10	2.24e-4	2.24e+1	4.45e-7		
Ta-182	3.23e+2	5.00e+1	1.00e+6	1.00e+1	5.00e+1	6.45e-10	3.23e-2	3.23e+1	6.45e-7		
Y-88	1.45e+2	4.00e+1	1.00e+6	1.00e+1	4.00e+1	3.63e-10	1.45e-4	1.45e+1	3.63e-7		
Total: 55	8.71e+4					1.11e-7	8.71e-2	8.71e+3	1.11e-4		

... web driven nuclear science

Applications Data Knowledge My Preferences Print Networking Nuclear Science Help New Browser Tab Logout

e-Ship++

radiological transport assistant

This is a beta version of the new web application e-Ship++. Please report errors to info@nucleonica.com.

DISCLAIMER: this tool is a help to choose the package classification, please always refer to the country specific regulations.

My Packages Edit Options Delay Import Activity limits Exempt RPO Sample packages About e-Ship

User defined transport packages

Package Name	Mass (g)	Items	Content	Form	State	Activity reported	last modified	Download
(Create, import a new package)								
1g irradiated UOX fuel	1		Material	Other	Solid	2013.08.01 08:12:23	2013.08.01 08:12:23	
ISOLDE Target	25000		Material	Other	Solid	2013.04.14 17:28:38	2013.04.15 09:14:00	
Decayed: Sr83	1		Material	Other	Solid	2013.04.11 16:50:25	2013.04.11 16:53:37	
Spectro	1		Material	Other	Solid	2012.01.06 08:00:00	2012.08.22 13:11:36	
Irradiated sample using 26 GeV protons	1		Material	Other	Solid	2012.05.24 08:00:00	2012.08.22 12:35:15	
Irradiated sample (Iron)	1		Material	Other	Solid	2012.02.27 08:00:00	2012.08.22 11:46:31	
Simple Package (Exempted)	1		Material	Other	Solid	2012.08.10 08:00:00	2012.08.22 11:23:31	
My 1st Package (Type A)	5		Material	Other	Solid	2012.08.03 08:00:00	2012.08.22 11:15:18	
My 1st Package (Exempted)	10		Material	Other	Solid	2012.08.02 08:00:00	2012.08.22 11:13:16	
My 1st Package (Exempted)	150		Material	Other	Solid	2012.08.01 08:00:00	2012.08.22 11:02:28	

DISCLAIMER: this tool is a help to choose the package classification, please always refer to the country specific regulations.

My Packages Edit Options Delay Import Activity limits Exempt RPO Sample packages About e-Ship

Package characteristics

Name (D=003): Irradiated sample (Iron)

Chemical form (please take care of subsidiary risk):

Description: Package created from CERN spectrum file. The activity was reported on 27.2.2012.

Host material: 1 g

Activity reported: 2012.02.27 08:00:00

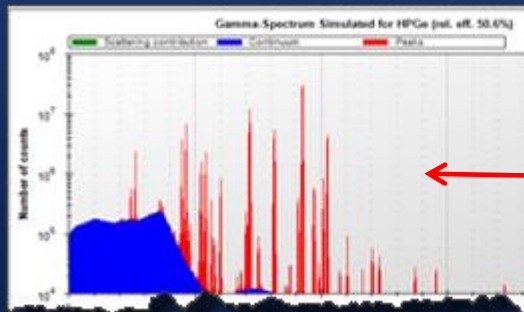
Nuclide	Activity A (Bq)	Mass (g)	Half life	A_1 (TBq)	A_2 (TBq)	Exempt (GBq)	Exempt (Bq)	Exempt (Bq/g)	A_1 (TBq/g)	A_2 (TBq/g)	Exempt (Bq/g)	A_1 (TBq/g)	A_2 (TBq/g)	Exempt (Bq/g)
Be-7	3.11e+4	2.40e-12	53.22 d	20	20	20.0	1.00e+07	1.00e+03	1.55e-9	1.55e-6	3.11e-3	3.11	31.1	
Co-56	185	1.65e-13	77.31 d	0.3	0.3	0.300	1.00e+05	1.00e+01	5.20e-10	5.20e-7	1.85e-3	18.5	18.5	
Co-57	1.02e+3	3.27e-12	271.80 d	10	10	10.0	1.00e+06	1.00e+02	1.02e-10	1.02e-7	1.02e-3	10.2	10.2	
Co-58	722	6.14e-13	70.86 d	1	1	1.00	1.00e+06	1.00e+01	7.22e-10	7.22e-7	7.22e-4	72.2	72.2	
Co-60	119	2.84e-12	5.271 y	0.4	0.4	0.400	1.00e+05	1.00e+01	2.98e-10	2.98e-7	1.15e-3	11.9	11.9	
Mn-54	785	2.74e-12	312.13 d	1	1	1.00	1.00e+06	1.00e+01	7.85e-10	7.85e-7	7.85e-4	78.5	78.5	
Na-22	5.25e+4	2.27e-10	2.6027 y	0.5	0.5	0.500	1.00e+06	1.00e+01	1.05e-7	1.05e-4	5.25e-2	5.25e+3	5.25e+3	
Sc-46	224	1.79e-13	83.79 d	0.5	0.5	0.500	1.00e+06	1.00e+01	4.45e-10	4.45e-7	2.24e-4	22.4	22.4	
Ta-182	323	1.45e-12	114.7 d	0.9	0.5	0.500	1.00e+04	1.00e+01	6.45e-10	6.45e-7	3.23e-2	32.3	32.3	
Y-88	145	2.81e-13	106.63 d	0.4	0.4	0.400	1.00e+06	1.00e+01	3.63e-10	3.63e-7	1.45e-4	14.5	14.5	
Total: 55	8.71e+4	2.40e-12							1.11e-7	1.11e-4	8.71e-2	8.71e+3	8.71e+3	

Element: 55, Property: Quantity, Value: 1.11e-7

Mass Activity Converter



Gamma Spectrum Generator



e-Ship++



Nuclide Mixtures

Nucleonica's trump card!



Neutron Activation

Decay Engine++



Dosimetry & Shielding++

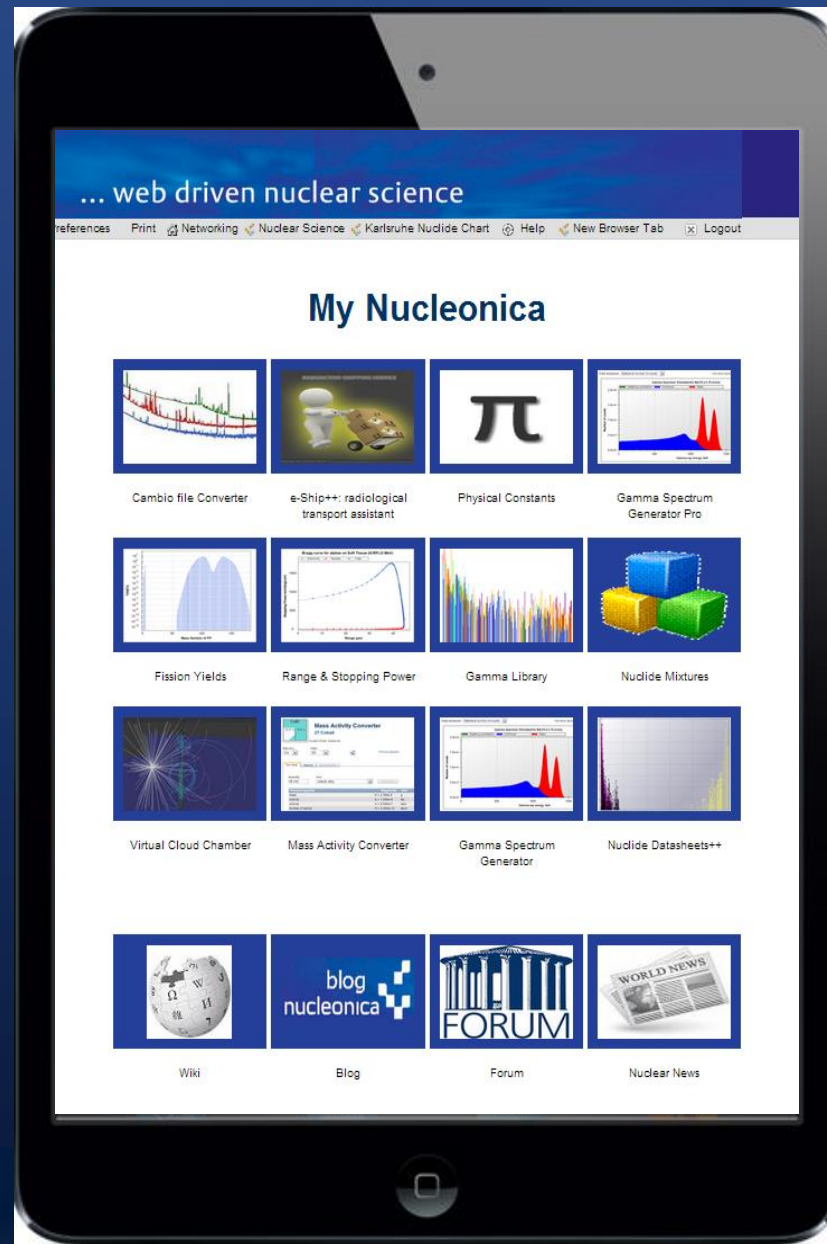


Nucleonica for Smartphones: and Tablet PCs: M-Learning



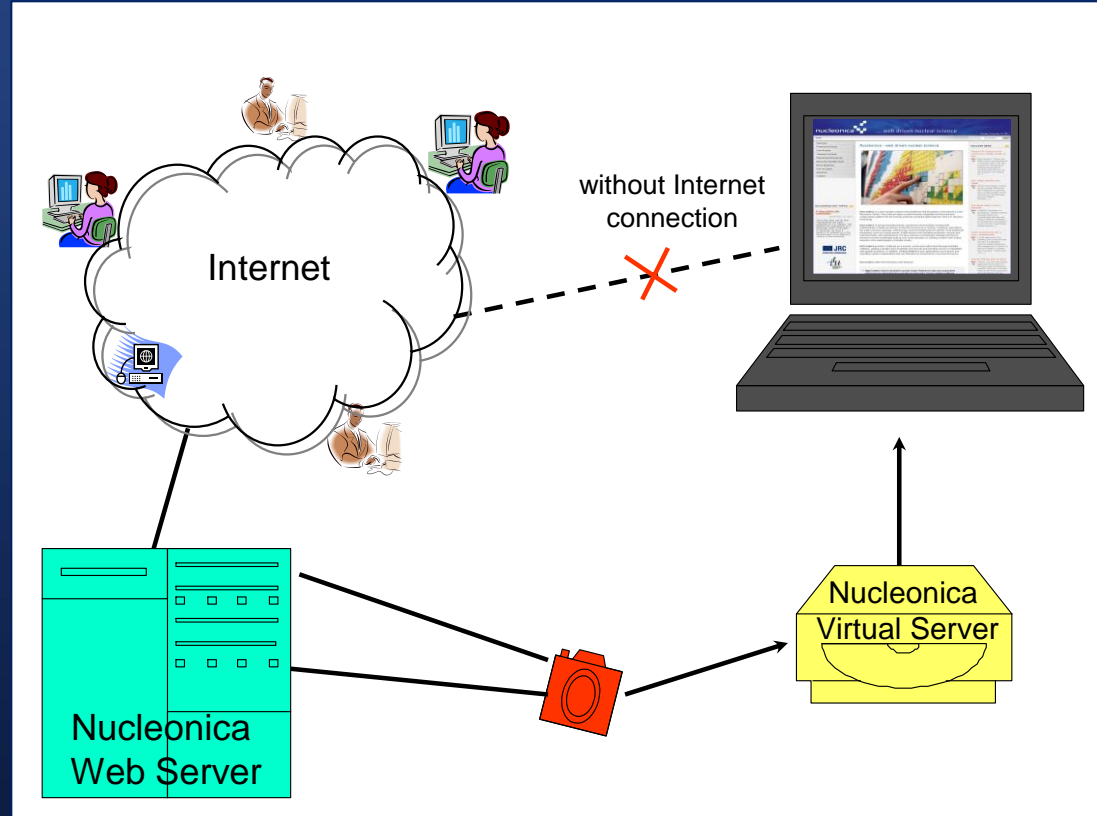
Sneak preview...
(coming soon)

Nucleonica „Apps“
optimised for
mobile devices



Standalone version of Nucleonica

- specially developed for mobile labs and field workers or for use on Notebooks/PCs where an internet connection cannot be guaranteed
- faster than internet version
- allows for more particles in Monte Carlo calculations than the internet version
- allows Monte Carlo dosimetry and shielding calculations (provided you have an MCNP license!)

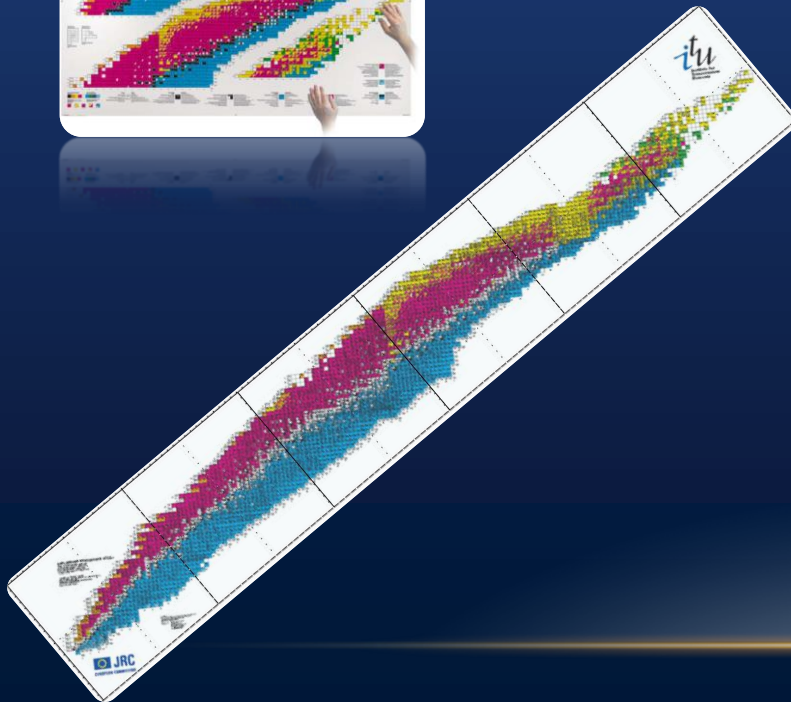


Education & Training with Nucleonica

Karlsruhe Nuclide Chart



- Fold-out Chart
- Wall-Chart
- Auditorium Chart
- Nuclide Carpet



Nuclide „carpet“
1m x 6.5m



Education & Training with Nucleonica

New Roll Map version of the Karlsruhe Nuclide Chart

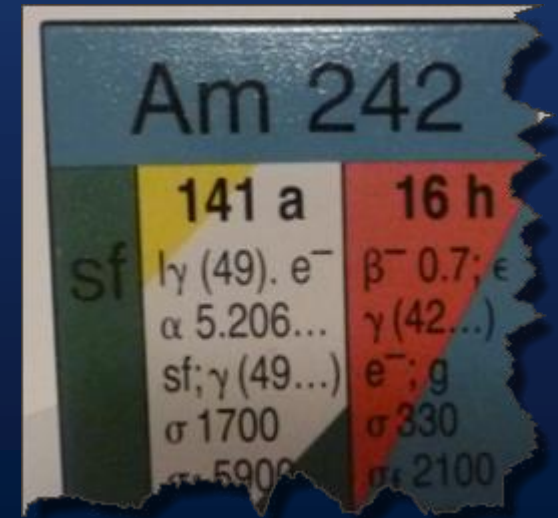
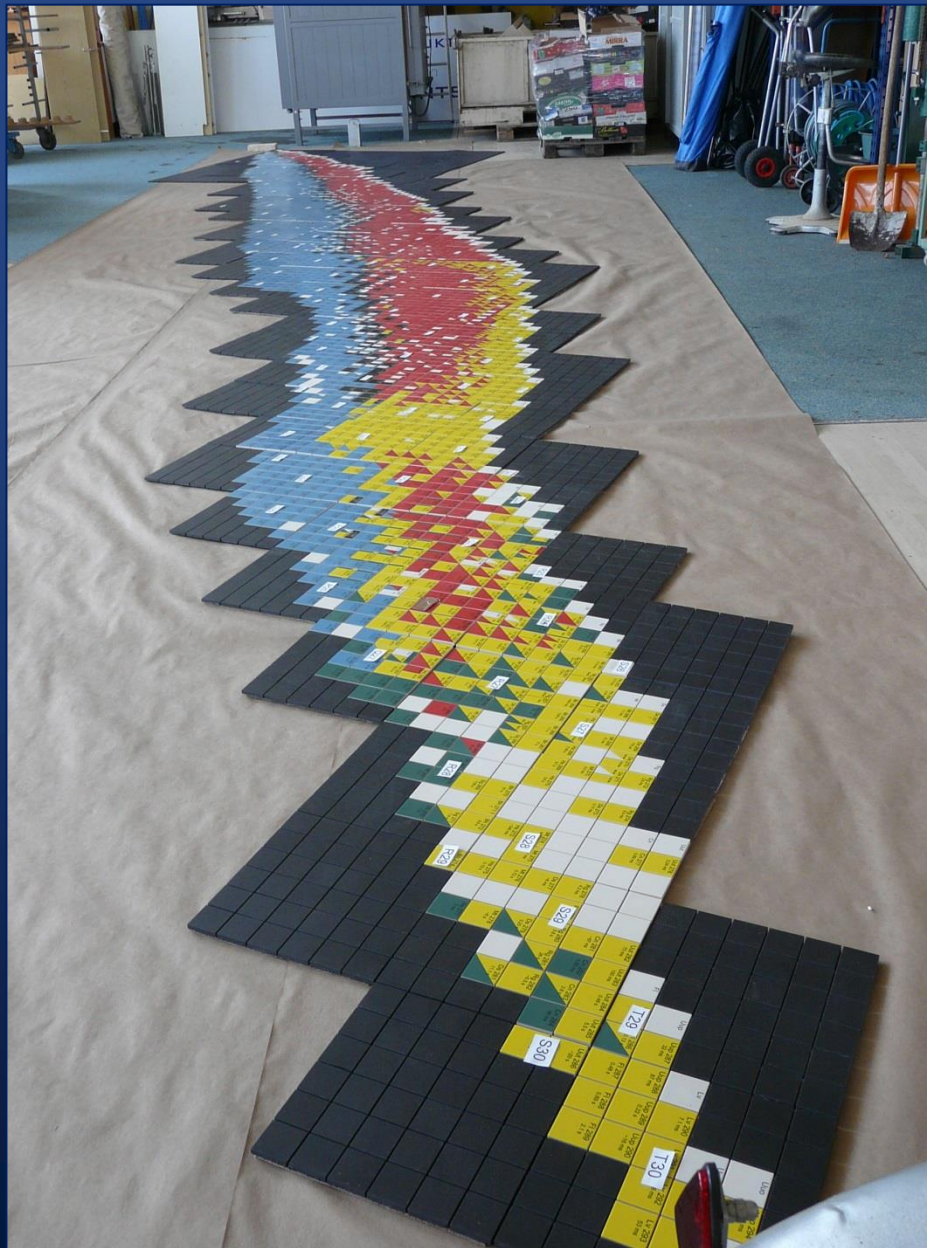


with clamping rails and
suspension system for
easy mounting...

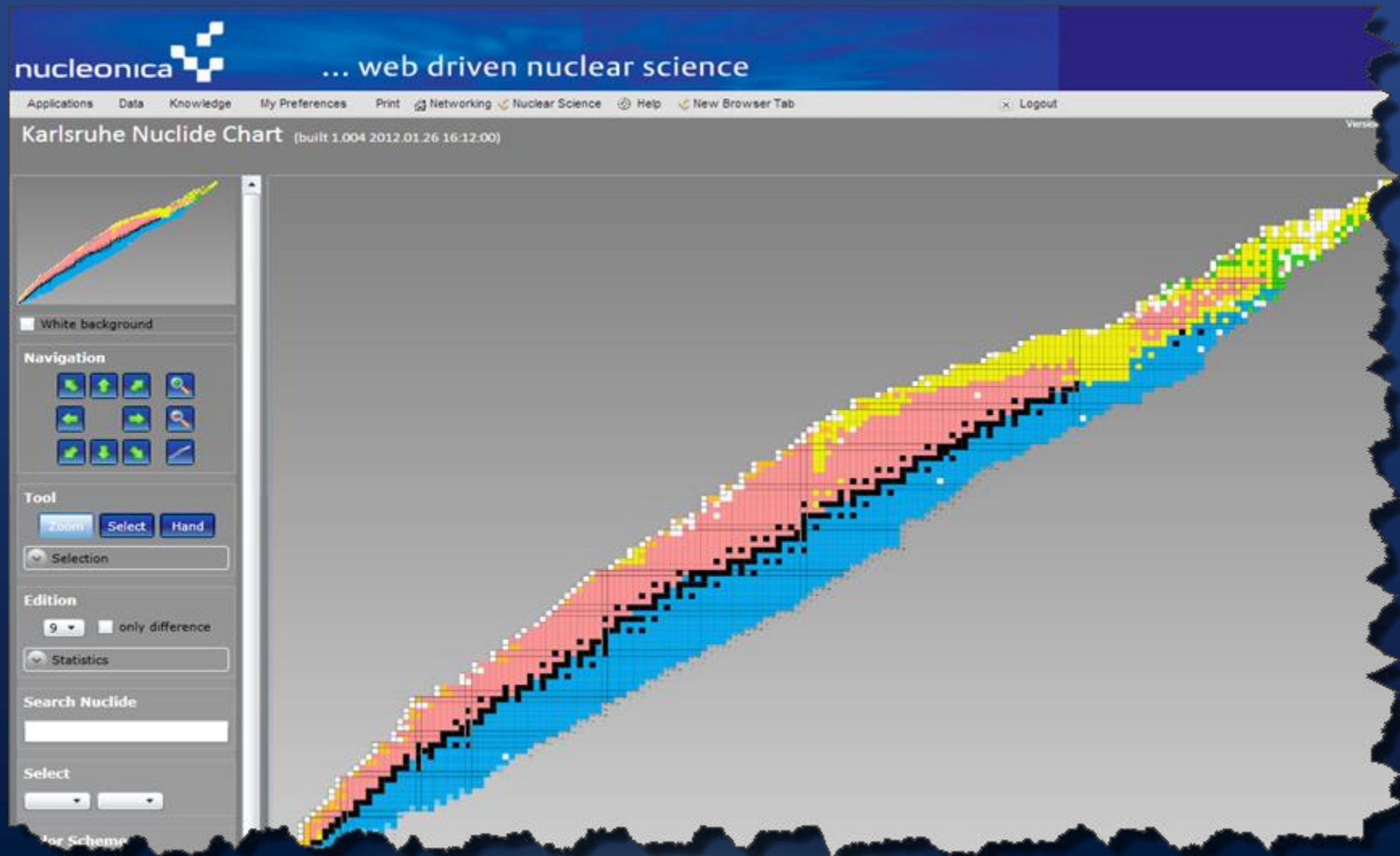


Unique mosaic tiles for the
Institute for
Transuranium
Elements,
Karlsruhe

15m x 7m



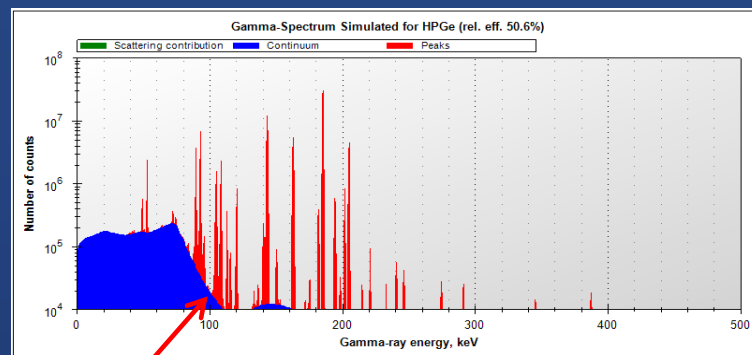
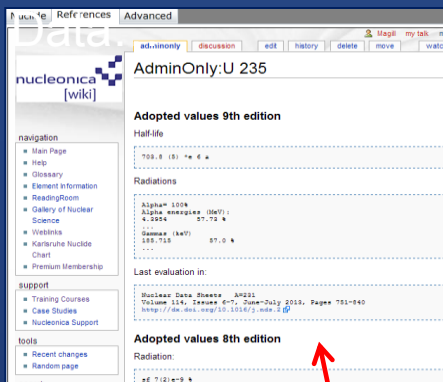
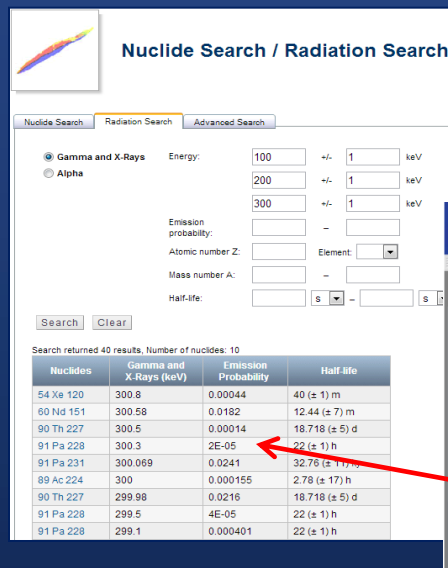
New: Karlsruhe Nuclide Chart Online...



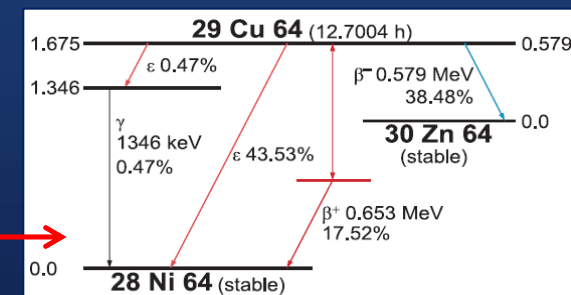
References...

Gamma Spectrum Generator...

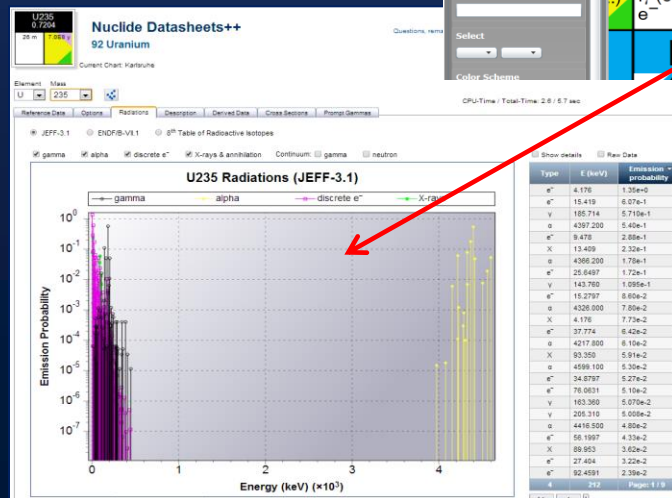
Nuclide / Radiation Search



Decay Schemes...



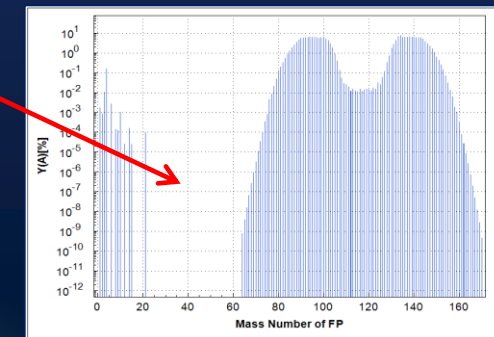
Nuclear Data...



Radioactive Decay...

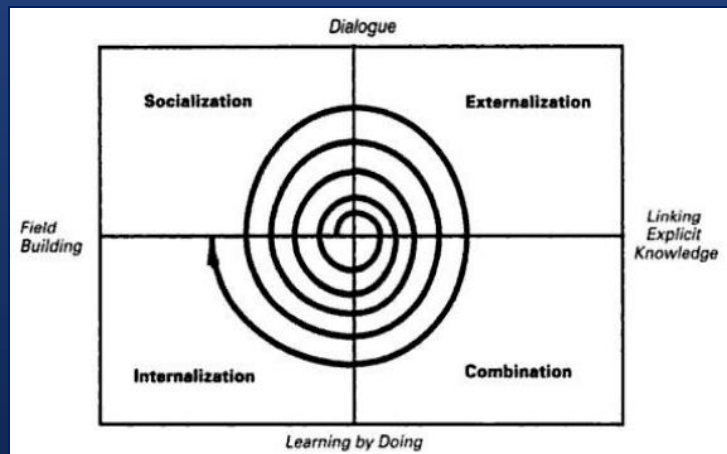


Fission Yields...

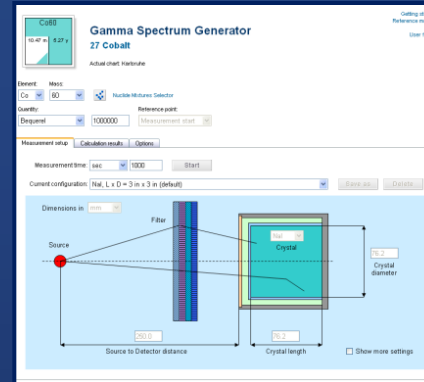


Knowledge Management with Nucleonica

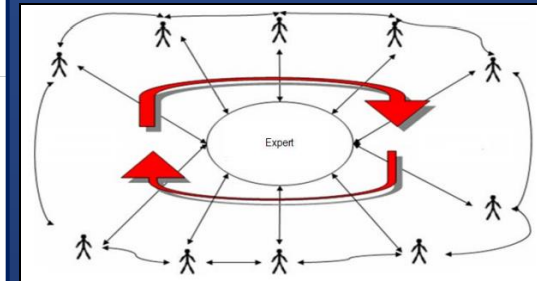
In this slide, the Nucleonica web portal is considered from a knowledge management perspective. Nonaka and Takeuchi have proposed the “knowledge spiral” (shown) in which there are four modes of knowledge conversion: socialization, externalization, combination and internalization (SECI model).



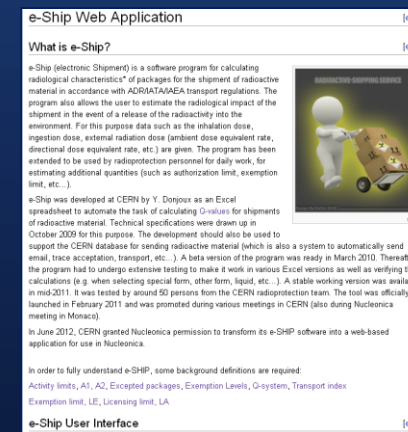
Socialisation: conversion of tacit knowledge to tacit knowledge e.g. an apprentice who works with tutor and learns from observing and imitating the tutor's actions. **Externalization:** conversion of tacit to explicit knowledge. **Combination** is the conversion of explicit to explicit knowledge. The process of systemizing already explicit knowledge into a knowledge system. **Internalization** is the conversion from explicit to tacit, which is closely related to “learning by doing”. At the end of the spiral process, one or more individuals in the organisation have acquired new tacit knowledge.



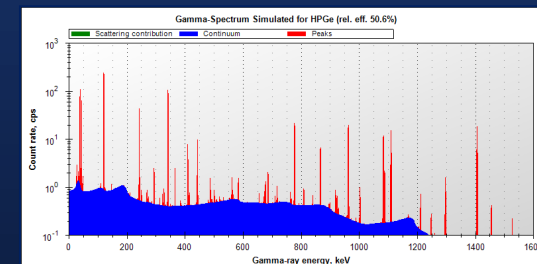
Socialisation: conversion of tacit knowledge to tacit knowledge



Externalization: conversion of tacit to explicit knowledge



Combination: systemizing explicit knowledge

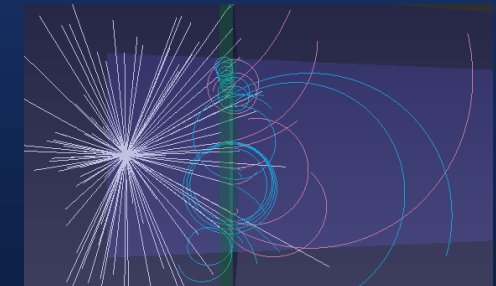
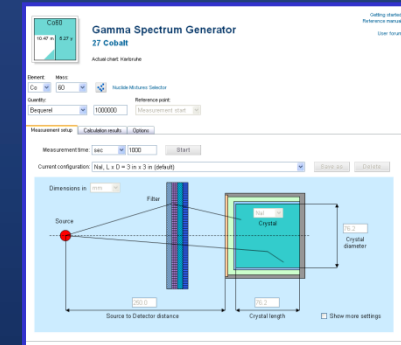
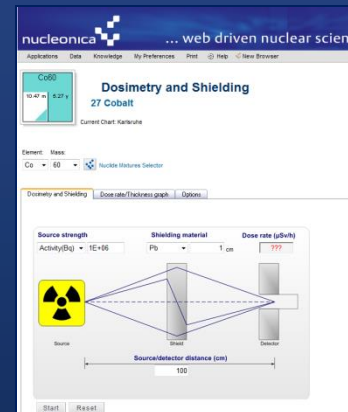


Internalization: conversion from explicit to tacit, triggered through “Learning by Doing”.

Nucleonica: Web-based Software Tools for Simulation and Analysis



- Nuclear Data Resources in Nucleonica
- Nuclear Science Applications & Tools
 - Decay Engine
 - Dosimetry & Shielding
 - Virtual Cloud Chamber
 - Gamma Spectrum Generator
 - webKORIGEN
 - e-Ship
- Education & Training with Nucleonica
 - Nucleonica Mobile
 - Karlsruhe Nuclide Chart
- Knowledge Management with Nucleonica



The Nucleonica Wiki...

page discussion view source history delete unwatch

Main Page

Welcome to the Nucleonica Wiki!


The Nucleonica wiki is an open knowledge resource for the nuclear sciences. In contrast to Wikipedia, which can be edited by anyone, the Nucleonica wiki articles are written by experts and practitioners in the field and cannot be edited. The Nucleonica wiki is devoted specifically to nuclear science. Wiki technology is best suited for this purpose since it allows addition of content at any time from any location.

Another aim the Nucleonica wiki is to provide the technical documentation in support of the Nucleonica nuclear science portal www.nucleonica.com. Whereas the Nucleonica portal requires registration to access its applications and data pages, the wiki is an "open" knowledge resource.

How this Wiki is organized

The Sidebar panel to the left of this window provides quick links to a number of important pages in this wiki. The links are grouped under:

- navigation
- support
- tools



category discussion edit history delete watch

Category:Glossary

This Glossary is based mainly on the following sources:

1. J. Magill and J. Galy, *Radioactivity Radionuclides Radiation* © Springer Verlag, 2005
2. J. Magill, G. Plennig, J. Galy, *Karlsruhe Nuclide Chart*, 7th Edition, 2006.
3. Additional information can be found in the IAEA Safety Glossary, Terminology Used in Nuclear Safety and Radiation Protection 2007 Edition.
4. See also the CIBTO glossary <http://www.cibto.org/glossary/>

Articles in category "Glossary"

There are 179 articles in this category.

E cont.	O
■ Exemption Levels	■ Orphan source
F	P
■ Fermion	■ Pair production
■ Find	■ Parity
■ Fissile	■ Particle Therapy
■ Fission	■ Photon
■ Fundamental forces	■ Physical protection
G	■ Polonium 210
■ Gamma radiation	■ Positron
■ Geological repository	■ Primordial radionuclides
■ Glioblastoma	■ Proton
■ Gram atom	Q
■ Gray, (Gy)	■ Quality factor
H	R
HAS	

readingroom discussion edit history delete move watch

ReadingRoom:Gallery of Nuclear Science

Contents [hide]

- 1 Actinide Science
- 2 Nuclear Science Historical
- 3 Nuclear Science in Karlsruhe
- 4 Karlsruhe Nuclide Chart, 7th Edition, 2006
- 5 Radioactivity, Radionuclides, Radionuclides: The 3 Ris of Nuclear Science 2005

Actinide Science

from the Institute for Transuranium Elements...



Curium metal produced by the Actinide Group, Institute for Transuranium Elements



Uranium metal (left) Institute for Transuranium Elements



It contains a collection of articles. Each article has a title (by which it is referenced) and optionally one or more categories. Special / Categories you can see all currently existing categories. Thus, it is possible to navigate through all documents by the category and subcategory tree feature of the Wiki.

Importance is the Help link. This page contains a collection of articles and is used specifically to support the Nucleonica applications and nuclear data pages. For users logged into the Nucleonica Portal, the context sensitive Help in Nucleonica will lead the user to the corresponding page in the wiki.

Another important item is the Search box. By entering a character string here, the entire wiki is searched. The search results are displayed in a coherent way. Enter a piece of text into the Search box (e.g. Curie) and try out this powerful search tool!

Nucleonica?
Nucleonica Newsletter

help discussion edit history delete move watch

Help:Decay Engine

Create [html file](#) for this document

Contents [hide]

- 1 Overview
 - 1.1 Simple Radioactive Decay
 - 1.2 Radioactive Decay Chains
 - 1.3 Convergent and Divergent Branches
 - 1.4 Radioactive Equilibrium
 - 1.4.1 ($t_1 \gg t_2$): Secular Equilibrium
 - 1.4.2 ($t_1 \approx t_2$): Transient Equilibrium
 - 1.4.3 ($t_1 < t_2$): The Half-life of the Parent is Shorter than that of the Daughter
 - 1.4.4 ($t_1 \approx t_2$): The Half-lives of the Parent and Daughter are Similar
- 2 Using the Decay Engine Module
 - 2.1 User Interface
 - 2.2 Options
 - 2.3 Graph
 - 2.4 Details
- 3 References

Overview

Simple Radioactive Decay

Radioactive decay is a random process. It is not possible to predict when a particular nucleus will decay. However, one can, however, evaluate the probability that a nucleus will decay in a time interval. The first identified by Rutherford, is

search

Go Search

The Nucleonica Blog...

Start of the Name Approval Process for the Elements of Atomic Number 114 and 116

February 19th, 2012

by Joseph Magill

A joint IUPAC/IUPAP Working Party (JWP) has confirmed the discovery of the elements with atomic numbers 114 and 116. In accord with IUPAC procedures, the discoverers proposed names as follows: flerovium and symbol, Fl, for the element with $Z = 114$ and livermorium with the symbol Lv for the element with $Z = 116$. The Inorganic Chemistry Division recommended these proposals for acceptance.

Comments should be submitted by 30 April 2012. The text of the Provisional Recommendation can be downloaded from

http://media.iupac.org/reports/provisional/abstract11/corish_300412.html.


Comments should be sent to Prof. John Corish at jcorish@tcd.ie.

116				Lv	Lv 290 7.1 ms	Lv 291 18 ms	Lv 292 18 ms	Lv 293 53 ms
					α 10.84	α 10.74	α 10.66	α 10.63
115		Uup	Uup 287 32 ms	Uup 288 87 ms	Uup 289 0.22 s	Uup 290 ~16 ms	176	
			α 10.69	α 10.46	α 10.31	α 9.96		
114		Fl	Fl 285 ~125 ms	Fl 286 0.13 s	Fl 287 0.48 s	Fl 288 0.69 s		
			α	α 10.19	α 10.02	α 9.96	α 9.87	

Extract from the new 8th Edition (2012) of the Karlsruhe Nuclide Chart showing the

isotopes of flerovium and livermorium

The Nucleonica Forum...



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If this is your first visit, be sure to check out the [FAQ](#) by clicking the link above. You may have to [register](#) before you can post: click the register link above to proceed. To start viewing messages, select the forum that you want to visit from the selection below.

+ Post New Thread

Threads 1 to 20 of 105

Page 1 of 6

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2

3












...


Last

Forum: General
 General comments

Forum Tools

Search Forum

Title / Thread Starter	Replies / Views	Last Post By
 Emergency preparedness analysis for decision-making Jeremie Muswema	Replies: 0 Views: 21	Jeremie Muswema 13-04-12 13:02
 Core Inventory calculations Jeremie Muswema	Replies: 1 Views: 20	HotCells 12-04-12 18:34
 Functionality of the "Gamma Library" Nko	Replies: 4 Views: 80	Jeremie Muswema 12-04-12 17:52
 Being notified for a new thread in the forum SpectrO	Replies: 4 Views: 314	SpectrO 15-03-12 10:59
  Reference book or paper about cross section for neutron induced reactions Giancarlo D'Agostino	Replies: 1 Views: 227	jmagill 09-02-12 07:44
 Free users and WESPA jvko	Replies: 1 Views: 243	jmagill 30-01-12 14:49
 NuTrONS-2 Monte Carlo, Monaco jmagill <div>12</div>	Replies: 10 Views: 2,047	zeynepyarar 17-11-11 22:09
 Fission products from spontaneous fission FAQ	Replies: 1 Views: 246	FAQ 09-11-11 07:17
 webKORIGEN output in EXCEL format XRay	Replies: 1 Views: 599	HotCells 26-09-11 18:26
 Why does HEU produce fewer counts than pure U235 in the Gamma Spectrum Generator	Replies: 1 Views: 464	HotCells 12:02



The Nucleonica Glossaries...

nucleonica [wiki]

category discussion view source history

Category: Glossary

Additional information can be found in the IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection 2007 Edition.

Sub-categories Packaging, Nuclear Data

Pages in category "Glossary"

The following 200 pages are in this category, out of 260 total.
(previous 200) (next 200)

A

- A1, A2
- Absorbed Dose
- Abundance
- Actinide(s)
- Activated material
- Activity
- Activity limits
- Acute Exposure
- ADR
- ALARA
- ALARP
- ALI
- Alpha decay
- Alpha particle
- AMAD
- Ambient dose equivalent $H^*(10)$
- Annual Limit of Intake
- Annual Limit of Intake (ALI)
- Antimatter
- Atom
- Atomic mass
- Atomization

D cont.

- Decay constant
- Decay modes
- Decommissioning
- Decontamination
- Depleted uranium
- Derived air concentration (DAC)
- Derived water concentration (DWC)
- Detection/monitoring
- Disintegration
- Dose
- Dose coefficient, $e(t)$
- Drip-lines

E

- E-Ship++
- Effective dose coefficient
- Effective dose, E
- Electromagnetic Radiation
- Electron
- Electron capture
- ENDF/B-VII-1
- Enriched uranium

K cont.

- KNK-II

L

- Lanthanides
- Lepton
- Lethal dose
- Licensing limit, LA
- Light water
- LLW
- LNT
- Low enriched uranium (LEU)
- Low specific activity LSA
- LWR

M

- Magic numbers
- Mass defect
- Mass excess
- Mass number
- Mean decay energies
- Mean lifetime
- Minor Actinide

nucleonica [wiki]

category discussion view source history

Category: Glossary.Packaging

All Glossary articles related to Transport & Packaging

General References:

IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection 2007 Edition

ADR 2013: Volume I: Agreement and Protocol of Signature, Annex A: Parts 1 and 2, Part 2: Swiss Radiological Protection Ordinance (RPO) B

Nucleonica's e-Ship++

Pages in category "Glossary.Packaging"

The following 60 pages are in this category, out of 60 total

A

- A1, A2
- Absorbed Dose
- Activated material
- Activity limits
- ADR
- ALI
- Ambient dose equivalent $H^*(10)$
- Annual Limit of Intake
- Annual Limit of Intake (ALI)

C

- ReadingRoom Clearance
- Committed effective dose, E
- Committed equivalent dose, H
- Consignment
- Consignment material

D cont.

- Dose
- Dose coefficient, $e(t)$

E

- E-Ship++
- Effective dose coefficient
- Effective dose, E
- Enriched uranium
- Equivalent dose, H
- Excepted packages
- Exempted
- Exemption Levels
- Exemption limit, LE

G

- Guidance value

Q-system

R

- Radiation weighting factors
- Radioactive contents
- Radioactive material
- Radiological limits

S

- Sealed source
- Shipment
- Special form
- Special nuclear material

support

- Training Courses
- Case Studies
- Nucleonica Support

tools

- Recent changes
- Random page

search

Go Search

toolbox

- What links here
- Related changes

Nucleonica: Tips & Tricks

1. Using browser tabs
2. Using the wiki context sensitive Help
3. Accessing the Nucleonica blog
4. Increase font size in your browser
5. Using the datagrid / slider control to rearrange data
6. Increase the default size of graphs in your web browser
7. How to change your login username and password



What you see when you login: Networking page - Wiki, Blog, Forum, ...

The screenshot displays the Nucleonica web application interface. At the top, the header features the Nucleonica logo and the tagline "... web driven nuclear science". Below the header is a navigation bar with links: Applications, Data, Knowledge, My Preferences, Print, Networking (highlighted with a red circle), Nuclear Science, Help, and New Browser Tab. A Logout link is also present.

The main content area is divided into several sections:

- Nucleonica Networking**: A sidebar menu with links to Networking, My Profile, My Community, My Mailbox, My Groups, and My Settings.
- Tools**: A sidebar menu with links to Forum and webGraph.
- Applications Portal**: A sidebar menu with a link to nuclear science.

The central content area displays a list of news items:

- ENDF/B-VII.1 decay data now available in Nucleonica** (June 20, 2013): The ENDF/B-VII.1 decay data sublibrary is now available in Nucleonica in addition to the previously used decay data library JEFF3.1. It is now possible to compare and contrast the main European (JEFF3.1) and American (ENDF/BVII.1) data libraries for differences in half-lives, branching ratios, energies and emission probabilities of the emitted radiations, etc. using Nucleonica's user friendly tools.
- Nucleonica Blog**: A section containing several blog entries:
 - Nuclide Mixtures now with Elements**: The Nuclide Mixture application in Nucleonica allows the user to create nuclide mixtures which can be used in many other Nucleonica applications (e.g. Mass Activity Converter, Decay Engine++, Dosimetry & Shielding++, Gamma Spectrum Generator, webKORIGEN, etc.). To create a nuclide mixture, the nuclides are selected from drop-down menus and added to the newly defined mixture. [...]
 - Nucleonica: Basic, Core and Advanced Applications and Tools, 3-4 Oct. JRC IRMM Geel, Belgium, 2013**: This 2-day training course took place at the JRC's Institute for Reference Materials and Measurements (IRMM) in Geel, Belgium during the 3-4 October 2013. The course focused mainly on the Nucleonica Basic, Core and Advanced Applications and tools. A detailed description of nuclear data with particular reference to the various Nucleonica nuclear databases was given. [...]
 - Nucleonica welcomes ČEZ (Czech Republic) users**: Through an institutional license agreement, staff at the ČEZ (the largest electricity producer in the Czech Republic) has now full Premium access to the Nucleonica applications and features. ČEZ Group belongs among the top ten largest energy companies in Europe. The Nucleonica team looks forward to a close interaction with the ČEZ colleagues and encourages [...]
 - New server park for Nucleonica servers**: In the near future, the Nucleonica web servers are being moved to a completely new high-performance data centre located in Germany. This new centre works much more energy efficiently and provides high safety standards. These advantages are of direct benefit both to the environment and to our users. The move is scheduled for 22.09.2013 between [...]
 - New Dosimetry & Shielding++ released**: As announced in the Nucleonica Newsletter at the beginning of the year, we are currently upgrading most of the applications with a view to improving user-friendliness and calculation / response times. This means in practice fewer calls to the webserver and more emphasis on local client side computing. The next application to be released incorporating [...]

On the right side of the interface, there is a sidebar with the following sections:

- Welcome, iss1**: A section with links to My Settings, My Profile, and My Community.
- My Community Events**: A section showing 0 new messages and 0 new contact list requests.
- Recent Nucleonica Members**: A section displaying profiles of Michael Berglund, Bjoern Stuebner, Andreas Vogt, and Peter A. Fischer.
- Nucleonica Forum**: A section containing forum posts:
 - Whats the difference between the Decay Engine++ and the Decay Engine applications?**: Recently I've seen there is a new Decay Engine++ application. What's the difference between this and the previous Decay Engine?
 - Karlsruhe Nuclide Chart data in Nucleonica?**: It seems that Nucleonica only uses the 7th edition of Karlsruhe Nuklidkarte instead of the obviously available 8th. May I ask if that is true and...

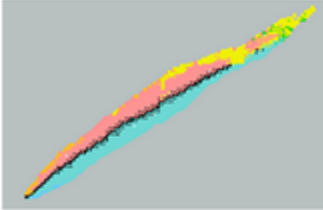
What you see when you login – Nuclear science page

Logged in as: magill (Administrator) Search Forum Calculator Privacy

nucleonica ... web driven nuclear science

Applications Data Knowledge My Preferences Networking **Nuclear Science** Help New Browser Logout

> Nuclide Explorer



Actual Chart: Karlsruhe

> Search Nucleonica Documentation

Nuclide Search / Radiation Search

nucleonica [wiki]

> Application Centre

- » Mass Activity Calculator
- » **New:** Mass Activity Converter
- » Decay Engine
- » **New:** Decay Engine++
- » Dosimetry & Shielding
- » Range & Stopping Power
- » In Silico Dosimetry
- » webKORIGEN
- » Decay Engine for Large Nuclide Sets
- » Universal Nuclide Chart
- » Transport & Packaging
- » **New:** e-Ship: radiological transport assistant
- » Nuclide mixtures
- » Nucleonica Scripting
- » Radiological Dispersion Module
- » Gamma Spectrum Generator
- » Gamma Spectrum Generator Pro
- » Virtual Cloud Chamber
- » Geant4 Dosimetry
- » easy Monte Carlo
- » Cambio file Converter
- » WESPA
- » **New:** WESPA2
- » Gamma Library
- » webGraph

> Data Centre

- » Physical Constants
- » Nuclide Explorer
- » Nuclide Datasheets++
- » Nuclide Data Sheets Reference Data

Welcome, Joseph

My Settings Administration

Networking

> My Last Nuclides

- » 35 Br84
- » 55 Cs137
- » 84 Po218
- » 84 Po210
- » 92 U238

> My Nuclide Mixtures

- » Decay of 1.00×10^6 Becquerel of 94 Pu 238 after 28.5806 Years(0)
- » Natural Uranium
- » Decay of 1×10^6 Becquerel of 92 U 235 after 7.04×10^9 Years(0)
- » Decay of 1.00×10^6 Becquerel of 92 U 235 after 7.03814×10^9 Years(0)
- » Element Mg

> My Sources

- » test cobalt
- » testoo
- » Pu241 with daughters
- » Pu241- 15mg - 8y old - solid, non-special form
- » Uranium metal
- » Uranium.xml
- » Pu239 1 g

> My Messages

No messages for you at the moment

> User Alerts

No alerts at the moment

Thank You!